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PATENT & TRADEMARK OFFICE

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	**Wood et al**	§	
		§	**Art Unit:**
Ser. No.:	**10/051,314**	§	
		§	**Examiner:**
Filed:	**01/16/02**	§	
		§	**Atty File: SC 036**
For:	**Soil Cleaning**	§	

PRELIMINARY AMENDMENT

Original, Marekd-up Pages 21, 26, 27, 28

such method wherein the system includes rehydration apparatus and the method includes rehydrating the discharged heated cuttings with the rehydration apparatus to facilitate handling of the heated cuttings.

The present invention, therefore, in certain aspects, provides a method for remediating wellbore cuttings from a wellbore, the method including feeding a slurry of the cuttings with oil, fine particulates, and water to a thermal treatment system and heating the cuttings therein producing heated cuttings and a stream with oil and water, discharging the heated cuttings from the thermal treatment system, feeding the stream with oil and water to a dual component separation system, separating out solid particulates from the stream with oil and water, feeding the stream with oil and water to a condenser system producing a liquid stream, and feeding the liquid stream to an oil/water separator producing an oil stream and a water stream.

A system 100 according to the present invention is illustrated in Fig. 5 ~~7~~ 7', 7''. Material to be treated is fed to an inlet 188 of a feed system 102 which includes a feed auger 189 for moving the material into a rotary dryer 101. Any contaminated material may be treated with the system 100 (e.g., but not limited to, material contaminated with volatile organic compounds, soil contaminated with hydrocarbons, drilling cuttings contaminated with diesel, oil etc.).

In the rotary dryer the material is heated to vaporize or burn off contaminants by one or more burners 190. Any suitable known dryer may be used or, alternatively, a dryer according to the present invention may be used, e.g., but not limited to, a dryer as in Fig. 4A.

In one particular aspect, drilled cuttings from a wellbore drilling operation are fed to the inlet 188, either on-site at a drilling rig or off site and remote from the rig. One type of such cuttings contain water, oil (diesel), drilling mud, sand, shale,

apparatus (not shown).

Figs. ~~7A~~ 7A'-7A''' shows a system 700 according to the present invention similar, in some aspects, to the system 100, Figs. ~~7~~ 7', 7'', and like numerals indicate like parts, apparatuses, lines, items, etc. The system of Figs. ~~7A~~ 7A'-7A''' differs from that of Figs. ~~7~~ 7', 7'', inter alia, in that: the system of Figs. ~~7A~~ 7A'-7A''' has a centrifuge 740 for cleaning diesel produced by separators 108, 109; heat supplied to the dual component separator 103 by a stream in heat exchange relation with a heat exchanger 710 in the thermal oxidizer 107; an optional recirculation circuit for providing a recirculation loop (which may be used in any system according to the present invention) for the dual component separator 103; a scrubber system 760 with a scrubber 701 that removes dust and/or steam from the feed to the mill 110. Insulation 731 around the dual component separator 103 in a housing or enclosure 730 inhibits or prevents unwanted condensation within the dual component separator 103. Other differences between the systems 100 and 700 are discussed below.

Solids separated by the dual component separator 103 flow through a rotary airlock 752 to a screw conveyor 753 which moves them (line 754) to a conveyor 713. Solids from the dryer 101 flow in a line 101a to the conveyor 713 and from there to a conveyor 712 which moves the solids through an airlock 756 to the mill 110.

The scrubber system 760 receives exhaust (e.g. with dust and/or steam) from the mill 110 in a line 741 which is fed to the scrubber 701. A fan 703 exhausts clean air from the scrubber 701 to the atmosphere or to additional collection and/or treatment apparatus. Water from the scrubber 701 flows in a line 732 to a tank 702 which is divided by a wall or weir 732a. Water flowing over the weir 732a is relatively clean compared to the water flowing into the tank 702 in the line 732. The fan 703 also sucks the exhaust from the mill 110 in the line 741. Any suitable known scrubber may be used; and, in one aspect, a scrubber with internal sprays spraying about 50 gallons per minute of clean water is used.

A pump 705 pumps water from the left side of the tank 702 in a line 734 for spraying into the mill 110 to facilitate its operation. A pump 704 pumps clean water from the right side (as viewed in Fig. 7A) of the tank 702 in a line 729 for use in the sprayers in the scrubber 701. Clean water from the tank 707 is pumped by a pump 735a in a line 733 to the clean water side of the tank 702. (The circled X's in various lines in Fig. 7A indicate valves and/or ckeck valves for controlling flow in those lines.) Line 750 provides, optionally and as needed, washdown cleaning water for parts, apparatuses, and components of the system and water for fire control. Water in line 751 provides, as needed, relatively cool water for cooling an end, ends, zone, or zones of the dryer 101 and/or to hydrate the feed to the dryer 101.

Vapor from the core separator 103 flow in a line 721 to a heat exchanger 710 in the thermal oxidizer 107, e.g. at about 700 to 900 degrees F. This vapor is heated about 10 to 50 degrees F. (in one aspect the temperature is increased about 25°F) in the heat exchanger 710 and then flows in a line 720 back to the dual component separator 103 and is fed into the separator 103 at its inlet feed. Optionally, by closing valves 720r and 721r and opening valve 721s, the lines 720, 721 provide a recirculation loop to effect recirculation (e.g. as described above for the systems of FIgs. 2A and 2B) of material for the dual component separator 103 (with line 720's inlet and line 721's outlet located to effect such recirculation). The thermostatic valve 124, by letting water from the separator 108, in line 179, flow to the condenser 105, assists in controlling the temperature in the condenser 105.

Optionally a chiller system 726a, e.g. with a heat exchanger and chiller, may be used in the line 171 from the condenser 105 (and, optionally, the demister or demisters 726 may be deleted) to reduce the temperature of the material in the line 171, e.g. from about 80°F to 60°F in one aspect, to condense more of the

hydrocarbons in the line thereby reducing the load on the thermal oxidizer. As does the pump 176, Fig. 7, pumps 723, 724 pump cooling liquid from the cooler 106 to the condenser 105. A blowdown tank 722 serves as a catch basin for liquid overflow from the quench system 104 and a pump 757 pumps liquid from the tank 722 to the separator 108 in a line 722a. A pump 706a pumps water in a l ine 747 from the tank 706 to the cooler 106. An air driven pump 739a pumps, as desired and in one aspect in a no-power or emergency situation, water in a line 739 to the dryer 101. Water from an adjacent well or reservoir is provided to the tank 706 in a line 741.

Demisters 726 correspond to and operate like the demister 126, Fig. 7. Fans 727 correspond to and operate like the fan 127, Fig. 7. Flame arrestors 725 correspond to and operate like the flame arrestor 165, Fig. 7.

An oil sump 709 is like the oil sump 132, Fig. 7. A pump 741 pumps material from the oil sump 709, e.g. material with oil and contaminants such as solids and sludge, to a disc centrifuge 740, e.g. any known suitable centrifuge for purifying a stream with oil etc. in it, including, but not limited to, suitable known disc centrifuges. Cleaned oil is fed back into the oil sump 709 and separated contaminants are flowed or pumped to a collection point or sludge pit. The pump 131 pumps oil (e.g. diesel and/or other hydrocarbons) from the oil sump 709 to a tank 708. A tank 711 for cleaned oil (e.g. diesel) may be used as an auxiliary fuel supply for generators, dryer, etc. A line 742 can provide fuel to any sgenerator in the system. A line 744 can provide fuel to the burners of the dryer 101. Fresh fuel may be supplied from a diesel tank 711 in a line 743 into the tank 708.

Water from the separator 109 flows to a sump 134 and a pump 135 pumps it from the sump 134 to a tank 707.

Cooling tower blowdown water flows in a line 106a to the tank 707. A line 734 is a bypass line which permits the pump 735a, as

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PRELIMINARY AMENDMENT

RECEIVED
FEB 28 2003
TC 1700 MAIL ROOM

Clean Pages 21, 26, 27, 28 With Amendments

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A system 100 according to the present invention is illustrated in Figs. 7′, 7′′. Material to be treated is fed to an inlet 188 of a feed system 102 which includes a feed auger 189 for moving the material into a rotary dryer 101. Any contaminated material may be treated with the system 100 (e.g., but not limited to, material contaminated with volatile organic compounds, soil contaminated with hydrocarbons, drilling cuttings contaminated with diesel, oil etc.).

Figs. 7A' - 7A''' shows a system 700 according to the present invention similar, in some aspects, to the system 100, Figs. 7', 7'' and like numerals indicate like parts, apparatuses, lines, items, etc. The system of Figs. 7A' - 7A''' differs from that of Figs. 7', 7'', inter alia, in that: the system of Figs. 7A' - 7A''' has a centrifuge 740 for cleaning diesel produced by separators 108, 109; heat supplied to the dual component separator 103 by a stream in heat exchange relation with a heat exchanger 710 in the thermal oxidizer 107; an optional recirculation circuit for providing a recirculation loop (which may be used in any system according to the present invention) for the dual component separator 103; a scrubber system 760 with a scrubber 701 that removes dust and/or steam from the feed to the mill 110. Insulation 731 around the dual component separator 103 in a housing or enclosure 730 inhibits or prevents unwanted condensation within the dual component separator 103. Other differences between the systems 100 and 700 are discussed below.

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Vapor from the core separator 103 flows in a line 721 to a heat exchanger 710 in the thermal oxidizer 107, e.g. at about 700 to 900 degrees F. This vapor is heated about 10 to 50 degrees F. (in one aspect the temperature is increased about 25°F) in the heat exchanger 710 and then flows in a line 720 back to the dual component separator 103 and is fed into the separator 103 at its inlet feed. Optionally, by closing valves 720r and 721r and opening valve 721s, the lines 720, 721 provide a recirculation loop to effect recirculation (e.g. as described above for the systems of FIgs. 2A and 2B) of material for the dual component separator 103 (with line 720's inlet and line 721's outlet located to effect such recirculation). The thermostatic valve 124, by letting water from the separator 108, in line 179, flow to the condenser 105, assists in controlling the temperature in the condenser 105.

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